



# The Text Encoding Initiative: 30 years of accumulated wisdom and its potential for a bright future

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# The Text Encoding Initiative: 30 years of accumulated wisdom and its potential for a bright future

Laurent Romary, Inria

# In the beginning



Text archives  
Humanities  
Standards  
SGML

*Not intended  
(immediately)  
for individual  
scholars*

*1. Novembre 1987:  
Vassar College,  
Poughkeepsie*

# A quick historical overview

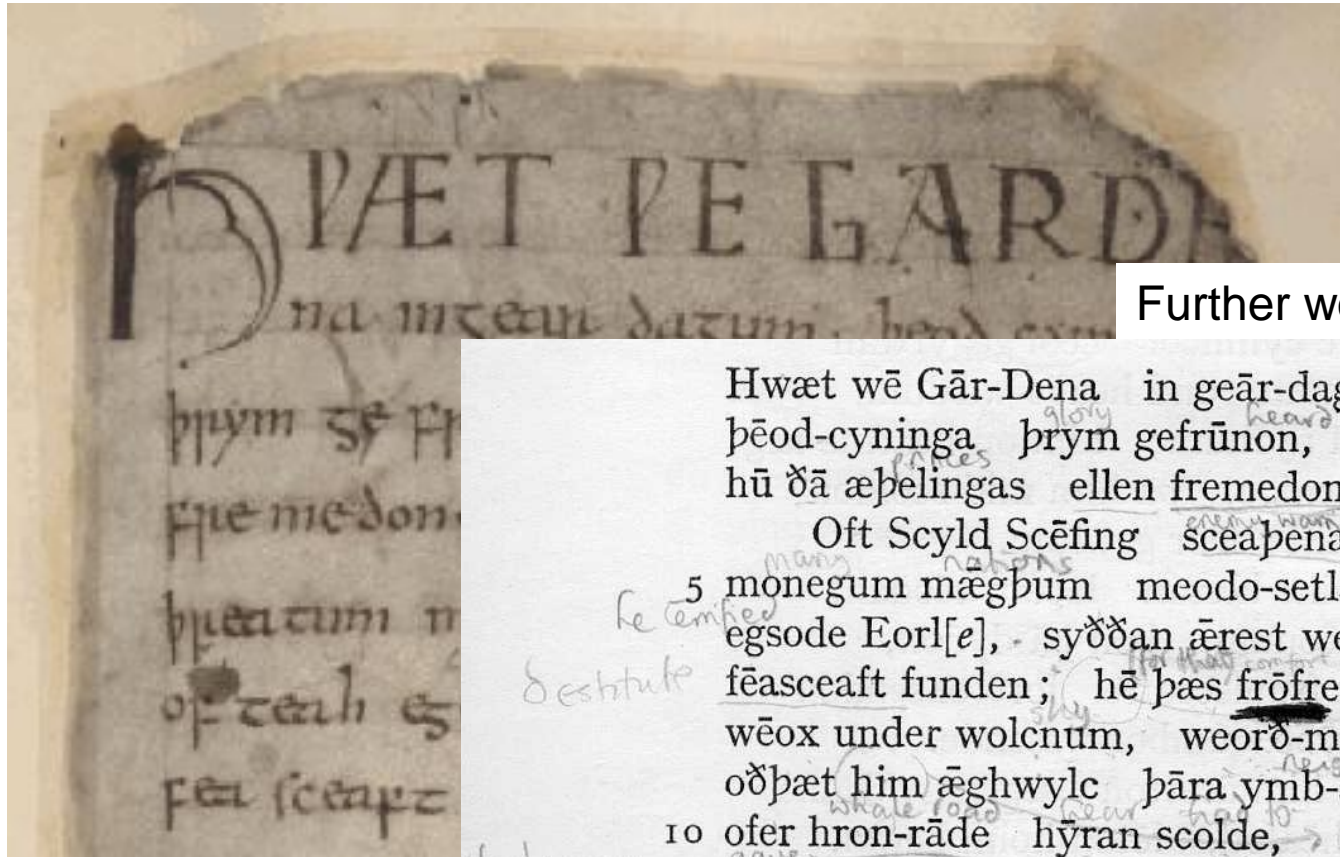
- 1960's — GML (Generalized Markup Language) by IBM
- 1970's & 1980's — ANSI initiates project to develop a Standard text-description language based on GML
- 1983 — SGML became an industry standard
- 1986 — SGML (Standard Generalized Markup Language) becomes an ISO standard: ISO 8879:1986
- 1987 — TEI (Text Encoding Initiative)
- 1990 — HTML 1.0 (HyperText Markup Language)
- 1992 — TEI edition P3 (Michael Sperberg-McQueen and Lou Burnard, eds)
- 1997/1998 — XML 1.0 (eXtensible Markup Language) (Tim Bray, Jean Paoli and Michael Sperberg-McQueen, eds)

# TEI for digital scholarly work

- A trend towards digital curatorship
  - Describing digital sources: meta-data
  - Understanding and representing the structure of digital sources: content
  - Enriching (annotations, links), versioning, disseminating
- A wide user community
  - From individual scholars to large digitization [projects](#)

# The standard scenario?

Digitizing source documents



Further work on documents

Hwæt wē Gār-Dena in geār-dagum

þēod-cyninga þrym gefrūnon,

hū ðā æþelingas ellen fremedon.

Oft Scyld Scēfing sceapena þrēatum,

5 monegum mægþum meodo-setla oftēah;

egsode Eorl[e], syððan ārest wearð

fēasceaft funden; hē þæs frōfre gebād:

wēox under wolcnum, weorð-myndum þāh,

oðþæt him āghwylc þāra ymb-sittendra

10 ofer hron-rāde hyran scolde,



# TEI in a nutshell

- TEI namespace:
  - xmlns="http://www.tei-c.org/ns/1.0"
- TEI documentation:
  - <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/>
- TEI processor, Roma:
  - <http://www.tei-c.org/Roma/>
- TEI document model
  - Read: <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/DS.html>
- TEI architecture: modules, classes
- TEI vocabulary: more than 500 elements...
  - Read: <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/CO.html>

# TEI –core principles (1)

- The TEI document as a digital surrogate of a physical source
  - A TEI document is always part of a digital library workflow
    - Source – surrogate – enrichment – publication
    - Recorded in the header; encoded in the content
  - Born digital documents may as well encounter a succession of changes/versions
- The TEI document as an autonomous object in a DL workflow
  - Embedded meta-data + content
  - Multiple “hands”: annotation



# TEI –core principles (2)

- Favoring the semantics rather than the layout
  - (quasi) No presentational construct
  - Publication requires a transformation stage (XSLT; ePub, pdf, HTML, etc.)
- Document structure
  - Macro-structure: front-body-back
  - Meso-structure: divisions, paragraphs/lists/figures/etc.
  - Micro-structure: in-line annotation mechanisms
    - Dates, names, notes, references, foreign expressions, etc.

All you can encode...

# Examples

- Simple encoded text
  - [The Little Riding Hood](#)
- Scholarly paper
  - [Towards Higher Ground](#)
- Dictionaries
  - [Larousse](#)

Dear H. Everybody  
is O.K. Mrs. Butler  
from across the  
street died last  
night. Too bad is  
not it? Goodbye  
S. W.



```
<history>
<origin>
  <stamp type="postmarked">
    <placeName ref="#DesMoines">
      <settlement>Des Moines</settlement>
      <region>Iowa</region>
    </placeName>
    <date when-iso="1908-07-02T11:00">JUL 7 11AM 1908</date>
  </stamp>
</origin>
</history>
```

THIS SPACE MAY BE USED FOR  
CORRESPONDENCE

Dear H. Everybody  
is O.K. Mrs. Butler  
from across the  
street died last  
night. Too bad is  
not it? Goodbye  
S. W.

FOR ADDRESS ONLY

Miss Hattie Jacobs  
Madrid  
I.

```
<div type="back" facs="#noble0337b">
```

```
<div type="left">
```

```
<salute>Dear <persName ref="#HJ">H</persName>.</salute>
```

```
<p>Everybody <lb/>is O.K. Mrs. Butler <lb/>from across the <lb/>street died  
last <lb/>night. Too bad is <lb/>not it?</p>
```

```
<signed>Goodbye <lb/><persName>S. W.</persName></signed>
```

```
</div>
```

```
<div type="right">
```

```
<p>
```

```
<address>
```

```
<addrLine>Miss <persName ref="#HJ">Hattie Jacobs</persName></addrLine><lb/>
```

```
<placeName ref="#Madrid"><settlement>Madrid</settlement><lb/>
```

```
<region>Ia</region></placeName>
```

```
</address>.
```

```
</p>
```

```
</div>
```

How do you manage this?

# TEI as a standardization body (1)

- Consensus building
  - Community based decision process
- Maintenance
  - Two releases per year
- Publication
  - All TEI contents are available under the double CC-BY+BSD 2 clause license.

# TEI as a standardization body (2)

- Organization
  - Consortium of institutional and individual members
  - Conference, journal (jTEI)
- The TEI at work
  - Board: administrative aspects
  - Technical council: coordinates the evolution of the TEI guidelines



# Standardization work

- Community based workflow
  - Mailing list
  - GitHub – bugs and features
    - Recording all issues and decisions
  - Cf. ODD as a specification platform
- Deliverables
  - Documentation — [TEI guidelines](#) (more than 500 elements)
  - Schemas — DTD, RelaxNG, W3C
- Additional resources
  - Tools
    - Online customization: Roma
    - Online processing: OxGarage
    - Stylesheets (included in Oxygen)
  - Examples — [TEI by Example](#)

# Special Interest Groups (SIGs)

- Computer-Mediated Communication (Michael Beißwenger)
- Correspondence. (Peter Stadler and Joachim Veit)
- Education (TBA)
- Libraries (Stefanie Gehrke and Kevin Hawkins)
- Manuscripts (Dot Porter and Gerrit Brüning)
- Music (Raffaele Viglianti)
- Ontologies (Oyvind Eide and Christian-Emil Ore)
- Scholarly Publishing (Daniel O'Donnell)
- TEI for Linguists (Piotr Bański and Andreas Witt)
- Text and Graphics (John Walsh and Martin de la Iglesia)
- Tools (Serge Heiden)

# The TEI guidelines

- [Online documentation](#)
  - Prose description organized in chapters
  - Specific documentation for each element
  - Access to all examples from the guidelines
- Schema(s)
  - RelaxNG, W3C (, DTD)
  - Available online from the *Roma* interface
  - Delivered as packages (Ubuntu, Oxygen)
- The TEI guidelines as specifications
  - Documentation and schemas are generated from one single specification file
    - Expressed in a TEI sub-language: ODD (One Document Does it all)

# Varieties of TEI Conformance

- Pure *TEI-all* subset
  - Most TEI projects
- TEI subset with extensions
  - Cf. TBX in TEI
- Non TEI document with TEI constructs (defined as an ODD)
  - EAG extensions in the EU Cendari project
- Non TEI document defined by means of an ODD document
  - E.g. ISO 24616:2012 Language resources management
    - Multilingual information framework

# The central role of customization

- Each TEI project starts with the definition of a customisation
  - Module selection
  - Sub-setting elements
  - Reducing possible values or content models
  - Adding, when necessary, new descriptive object
- ODD as the technical platform for customization

# Consequences

- Family of formats
  - Comparison of two TEI-based projects through their ODDs
- Support for third-party projects
  - In-house maintenance of customization and documentation
    - E.g. DTAbF at the Berlin Brandenburg Academy of Sciences
  - Even non TEI application!
    - E.g. EAD n ODD
- Does not prevent one from knowing the TEI components...
  - Most projects can live with just a subset of the TEI ontology
    - With the strong possibility to impact on the guidelines themselves
      - E.g. <abstract>

# **EXPLORING NEW (AND OLD) REALMS**



# TEI: you're not alone...

- The hidden TEI: scientific information at the European Patent Office
- New components in teh TEI: <standOff>
- Working with others: ISO LMF

**SCIENTIFIC INFORMATION?**

# Characterising scientific documents

- Expert documents describing a specific scientific and technical progress with respect to the state of the art
- Three main domains
  - Scholarly publications
  - Standardisation documents
  - Patents
- Some common characteristics
  - Authorship: the basis of scientific attribution
  - Structure: usually a formal internal organisation
  - Vocabulary: technical terms are essential to convey (or hide) meaning
  - Network of references: relating to the state of the art
  - Certification: workflow, responsibilities, metadata

# Authorship

## **Publications** - *The essence of publishing*

- Importance of attribution
- Reflects the context and time of the research (project, affiliation, biography)
- The hidden hand of reviewers

## **Standards** - *Priority to the institution*

- Consensus building => large expert group
- ISO: no authors but project leaders
- W3C: editors

## **Patents** - *A variety of roles*

- Applicant/inventor/representative
- Opponents
- ... and *examiners*

# Workflow

## **Publications** - *Semi-formal*

- Traditional (vestigial?) concept of peer-review
- From author's initial manuscript to publisher's version
- Evolution in the role of each version (e.g. prior art)

## **Standards** - *Very formal*

- Decision process reflecting membership structure
- ISO: WD, CD, DIS, FDIS, IS
- One single reference document

## **Patents** - *Very formal*

- Review by patent examiners
- Coordination of multiple submissions: national, US, Europe, etc.
- Importance of initial submission date

# The European Patent Office

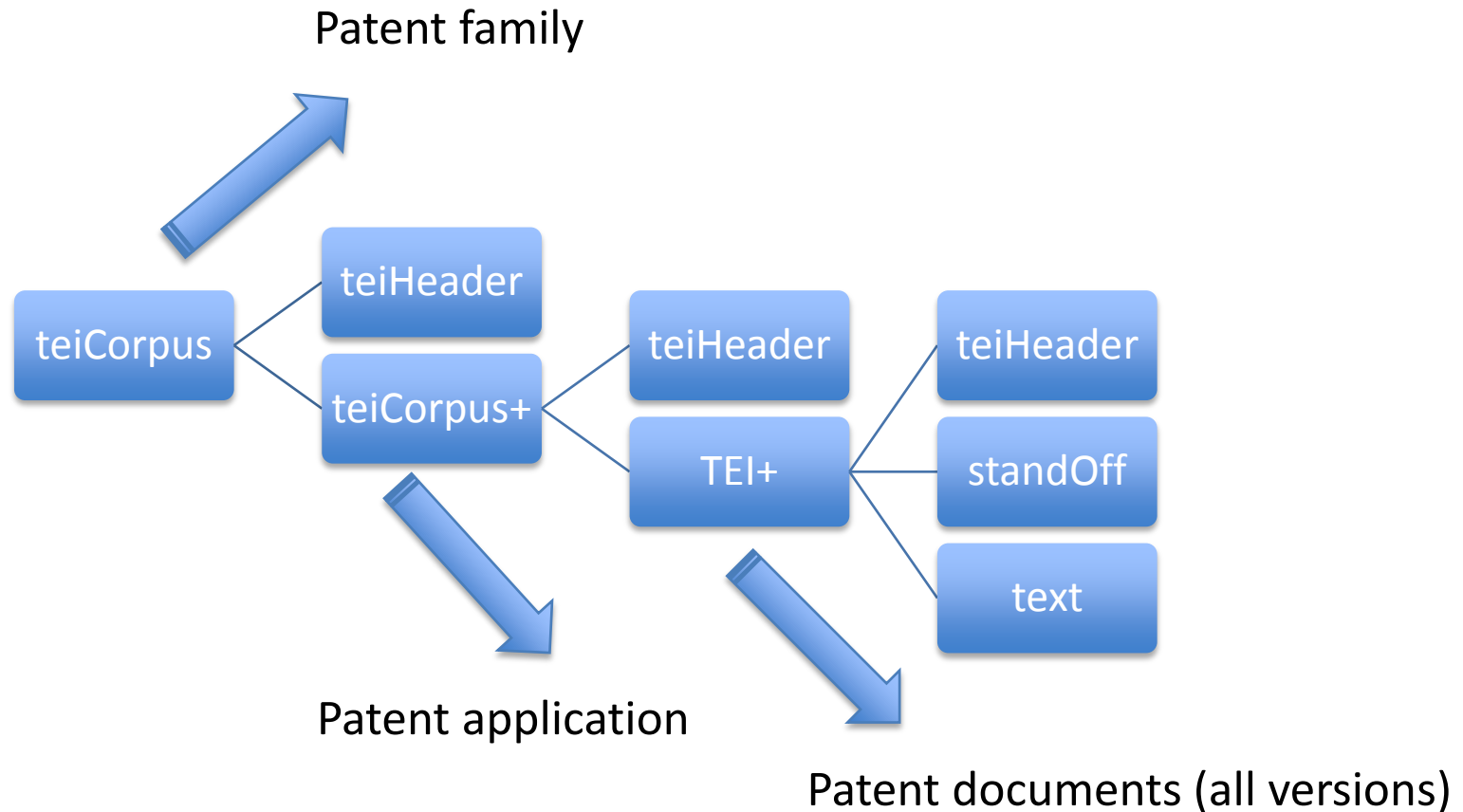
- The European one-stop shop for patent applications
- Examination of each application by experts from the field (examiners)
  - Based on existing patents as well as scholarly publications (aka *Non Patent Literature*)
- Some figures
  - Several thousands of examiners
  - 200 million documents
  - 2 billion annotations...

# The (simplified) patent life-cycle

- Patent application in one or several patent offices
  - USPTO, Japan, EPO (directly or initiated in a specific country)
  - First application: reference date for the patent (“coming into force”)
  - Form a “Patent family”
- Examination process for one application
  - Search report, communications, decision, appeal, opposition
  - Patent documents may be revised at each stage
- Necessity to have a single model for dealing with all stages and versions
- The TEI appeared to be the optimal choice



# The Patent Document Model



# The situation so far

- Complete implementation in the back-office system
  - Integration of several so-far dispersed data-bases
  - First large-scale implementation of <standOff> (be patient!)
- Quite a few customisations – maintained in a reference ODD specification
  - Re-use of TEI attributes at various places
    - @type, @cert, @sortKey
  - Bibliographic references to patents
  - Complex classification mechanism (<classCodeGroup>)
- All in all a large scale demonstration of the TEI possibilities
- Next steps
  - All scholarly publications (NPL)
  - All official communications

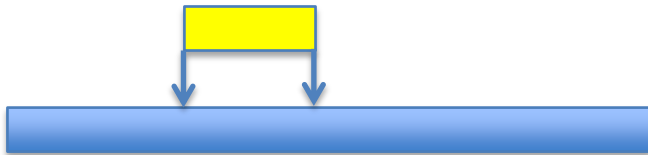
**WAKE UP STAND-OFF!**

# The simple picture



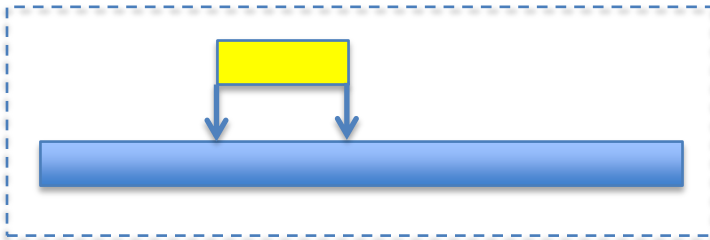
*Inline annotation:*

Intertwined with the source text



*Stand off annotation:*

Source text is referenced from outside



*Embedded stand off annotation:*

Stand off annotations attached to the same document as the source

# Why embedded stand-off annotation?

- In line (!) with the TEI philosophy
- Each time the source document is seen as the reference organisational unit
  - Corpus management
  - Transmission workflow
  - Multiple annotation layers
  - Competing annotations
    - E.g. Manual vs. automatic annotation

# Standoff: A long-standing issue

- The idea of standoff annotation is not new in general
  - Thompson & McKelvie, 1997
- Standoff annotation has been a core concept in the TEI guidelines since the beginning
  - Cf. Chapter: Linking, Segmentation, and Alignment
  - Availability of <anchor>, <span>, <interp>, <link>, @ana
- But: not integrated in the TEI architecture
  - Stand-off elements can appear anywhere in a TEI document
  - Usual trade-off between on-site vs. grouping (<back>)
- The NLP community has also developed its own means
  - GraF (Ide & Suderman 2007) , Paula (Zeldes et al. 2009), etc.
- Need for a proper, and inclusive, treatment of standoff annotations in the TEI
  - Better integration, more guidance

# Embedded standoff: Basic concept

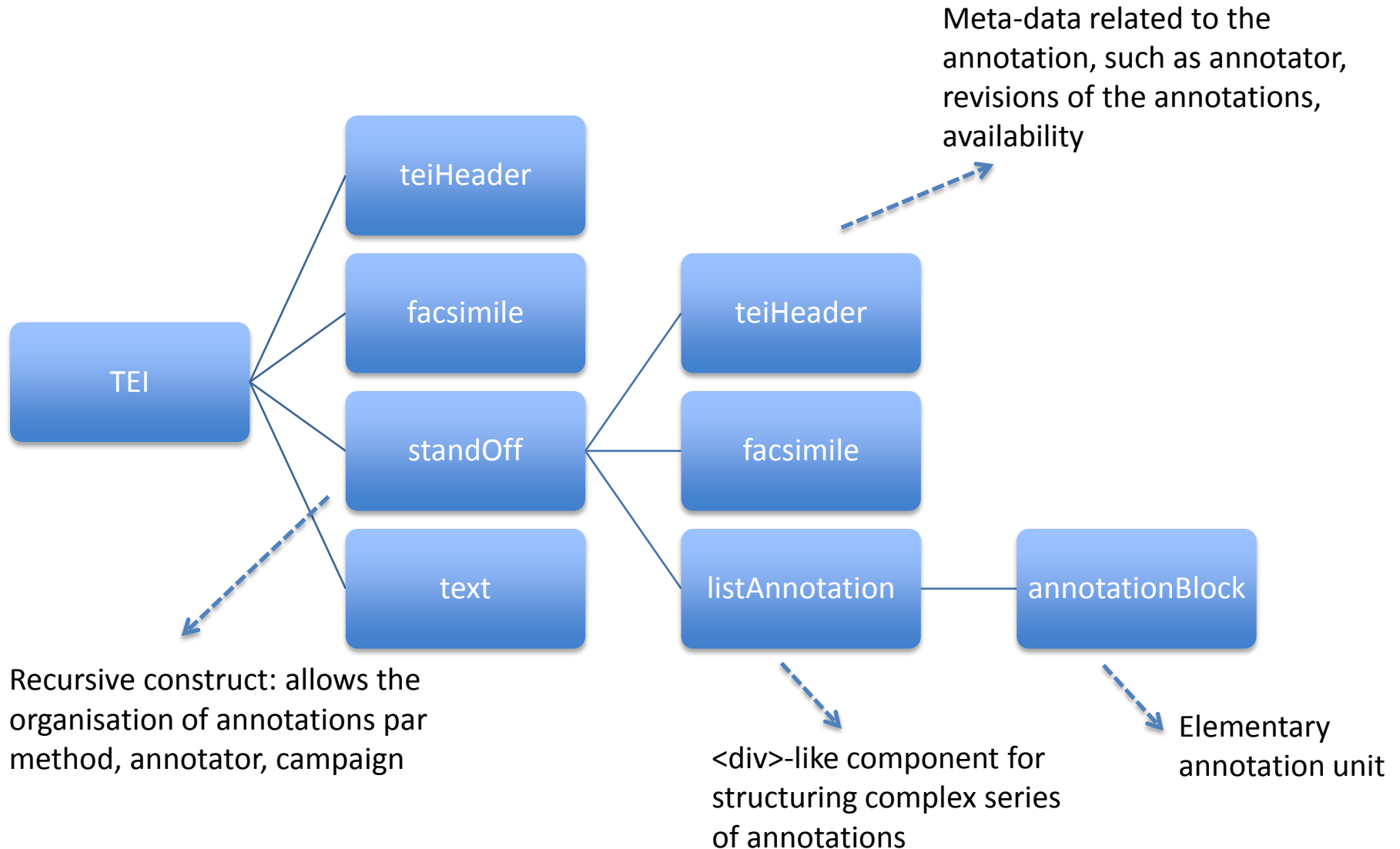
- Building up an autonomous document containing primary source and additional annotations
  - Annotations are conveyed with their specific meta-data
  - Annotations have their specific place in the TEI document architecture
  - Standoff annotations may be recursively organized
  - Standoff annotations may point to textual as well as facsimile content
  - Well-defined elementary annotation units
  - Coherence with existing models (Open Annotation, ISO TC 37) should be ensured
- Typical use-cases
  - Annotated corpora
    - Treebanks
  - Text mining
    - Named entity recognition, keyword/terms extraction
  - Human annotations on a document
    - critical editions, patent examination, peer review...
- Strong relation with interlinear annotation

# Timeline

- 2011: Paper by Thomas Schmidt in jTEI (<https://jtei.revues.org/142>)
- August 2012: new tickets by Javier Pose (EPO)
- January 2014: Workshop in Berlin
  - Draft of a first proposal
  - Setting-up a github environment
- 2012-2016: ISO 24624 project (Editor: Thomas Schmidt)
  - Need for a annotation grouping component (<annotationBlock>)
- May 2015: Council meeting in Ann Arbor
  - Several updates to the proposal
  - Stabilisation of element names
- March 2016: TEI release 6.0.0
  - New element <annotationBlock> for interlinear annotation
- August 2016: publication of ISO 24624 Transcription of Spoken Language



# Annotations in TEI: <standOff>



# Application: interlinear annotation

- Encoding interlinear annotation as inline content (in <text>)

```
<annotationBlock who="#SPK0" start="#T9" end="#T12" xml:id="au1">
  <u xml:id="u1">
    <seg xml:id="seg45" type="utterance" subtype="declarative">
      <w xml:id="w43">Nee</w> <pc xml:id="pc3">,</pc> <w xml:id="w44">hab</w> <w
xml:id="w45">kein</w> <w xml:id="w46">Führerschein</w>
    </seg>
  </u>
  <spanGrp type="en">
    <span from="#T9" to="#T12">No, I don't have a driver's license.</span>
  </spanGrp>
  <spanGrp type="pos">
    <span from="#w43" to="#w43">NE</span>
    <span from="#pc3" to="#pc3">$,</span>
    <span from="#w44" to="#w44">VAIMP</span>
    <span from="#w45" to="#w45">PIAT</span>
    <span from="#w46" to="#w46">NN</span>
  </spanGrp>
</annotationBlock>
```

# Standoff interlinear annotation

- Encoding interlinear annotation as stand-off markup

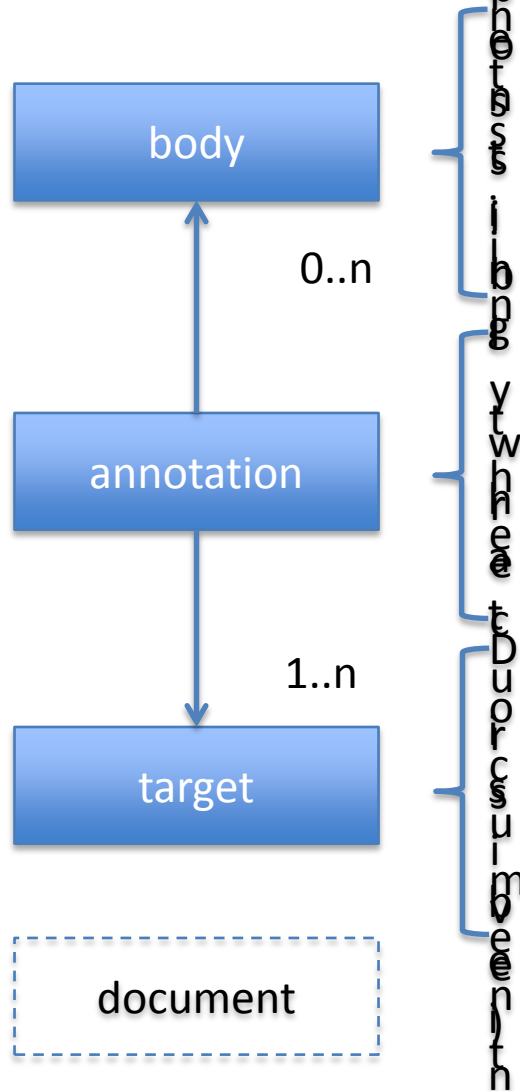
- In <standOff>

```
<annotationBlock inst="#u1">
  <spanGrp xmlns="http://www.tei-c.org/ns/1.0" type="en">
    <span from="#T9" to="#T12">No, I don't have a driver's license.</span>
  </spanGrp>
  <spanGrp xmlns="http://www.tei-c.org/ns/1.0" type="pos">
    <span from="#w43" to="#w43">NE</span>
    <span from="#pc3" to="#pc3">$,</span>
    <span from="#w44" to="#w44">VAIMP</span>
    <span from="#w45" to="#w45">PIAT</span>
    <span from="#w46" to="#w46">NN</span>
  </spanGrp>
</annotationBlock>
```

- In <body>

```
<u xml:id="u1" who="#SPK0" start="#T9" end="#T12">
  <seg xml:id="seg45" type="utterance" subtype="declarative">
    <w xml:id="w43">Nee</w><pc xml:id="pc3">,</pc>
    <w xml:id="w44">hab</w> <w xml:id="w45">kein</w> <w
xml:id="w46">Führerschein</w>
  </seg></u>
```

# Going further: mapping the Open Annotation model



<bibl>, <person>, <place>, <fs>, <note>,  
<body>, MAF, SynAF

<interp type="" inst="" ana="">

<span type="" from="" to="">

<zone type="" corresp="#\_theSurface"  
ulx="1253" uly="802" lrx="22" lry="29"/>

Any TEI object (with @xml:id) or <surface>

# Prototypical example

Dates in a named entity recognition context

```
<annotationBlock>  
  <date xml:id="E4N1" from="1944-08-17" to="1944-08-25">  
    17 - 25 août 1944</date>  
  <interp ana="#E4N1" inst="#d1e173"/>  
  <span xml:id="d1e173" from="#E4T6" to="#E4T10" />  
</annotationBlock>
```

Great advantage on readiness and programmatic treatment

# Issues (many)

- Which header do we need?
  - Standoff annotation usually requires very restricted meta-data
  - If we adopt the TEI header, we need to make it more flexible...
    - Should we have a convergence with biblFull (where profileDesc is missed, BTW, SF:533, deeply ambered)
  - Stand-off annotations may be generated by humans and machines
    - how to put <author> (editionStmt) and <appInfo> (encodingDesc) at the same place?
- How do we provide guidance concerning annotations?
  - Mapping the OA model to precise TEI constructs?
  - Allowing a wide variety of possible vocabularies depending on the use case?
    - TBX entries, MathML, full-text annotation (<body>?)
  - Aligning with the various ISO standards: MAF, SynAF and SemAF series

# Next steps

- Finalising the content model of <annotationBlock>
  - Completely open model?
  - Constrained with specific model classes? (OA)
  - Alternation between the two (or more) options
- Gathering reference example from existing implementations
  - Istex, Termith, EPO, IDS
- Finalising the graft in the guidelines
  - Section in chapter 16 Linking, Segmentation, and Alignment?
- Don't give up the fight...

**JOINING EFFORTS WITH OTHERS:  
TEI AND LMF**



# A divided landscape

- The TEI print dictionary chapter
  - Available since more than 20 years
    - See <http://www.tei-c.org/Vault/Vault-GL.html>
  - Used in a wide variety of dictionary projects
    - 6 entries just in <http://www.tei-c.org/Activities/Projects/>
    - Disseminated at quick pace within the COS E-NEL network (credits: Toma Tasovac)
- ISO 24613:2008 Language resource management - Lexical markup framework (LMF)
  - Shorter life span
  - Mostly implemented in NLP related activities
- Is it worth reconciling the 2?
  - Yes: for the sake of combining a well-defined model with a rich XML infrastructure
  - A need for the TEI to have a terser model
    - Curation, interchange, tools, automatic generation of TEI constructs
- Is it just possible.
  - Yes: and now!

# The need for a revision

- Main assets of ISO 24613 LMF
  - Comprehensive core model + series of annexes for additional modules
  - Perfectible XML serialisation...
- Going towards a multi-part standard
  - Simplifying the editorial process (drafting, decision making, revising; various tempi)
  - Reflecting the needs of specific communities (modules, serialisation)

# Overview of the current plans

- Resolution 2016-04.2 (WG 4) Multi-part development of LMF
  - Part 1: Core model
  - Part 2: MRDs
  - Part 3: Diachrony-Etymology
  - Part 4: TEI serialisation
  - Part 5: LBX serialisation

# (Part 4) A TEI serialisation for LMF

- Objective
  - Preventing re-inventing element that already exist
  - Eliciting constraints on the TEI model
- Method
  - Covering core model and a selected number of extensions
    - Remaining in the scope of the Print dictionary chapter
    - Extending scope if we feel there is a need from the potential TEI applications (e.g. syntax)
  - Sub-setting the TEI guidelines
    - Associating a definite TEI construct for each component of the LMF Meta-model
    - Adding constraints when necessary
      - (e.g. @xml:lang mandatory on <entry>?)
  - Complementing the TEI
    - Defining new constructs (or elements?) if necessary
      - We are not bound to the existing chapter, even if we have to abide to the Birnbaum principle

# Gathering mapping proposals

Component	TEI construct
Lexical Entry	<entry>...</entry>
Form	<form>...</form>
Lemma	<form type="lemma">...</form>
Word Form	<form type="inflected">...</form>
Syntactic Behaviour	??
??	<etym>

Data category	TEI construct
/PartOfSpeech/	<pos>
/Gender/	<gen>
...	

How far should we go here?

# Once upon a time, the clergyman...

```
<entry xml:lang="en">
  <form type="lemma">
    <orth>clergyman</orth>
    <gramGrp>
      <pos>commonNoun</pos>
    </gramGrp>
  </form>
  <form type="inflected">
    <orth>clergyman</orth>
    <gramGrp>
      <number>singular</number>
    </gramGrp>
  </form>
  <form type="inflected">
    <orth>clergymen</orth>
    <gramGrp>
      <number>plural</number>
    </gramGrp>
  </form>
</entry>
```

# (Part 3) The case of etymology

- A flat model in the current TEI chapter
  - No sense of etymon: <mentioned>
  - No sense of etymological process
    - Typed and recursive <etym>
  - No grouping of etymon related information
    - Usage, grammatical constraints, source, date, language, etc.
- A need for revision
- Pushing a fully fledged model

# Before-after example

## Old school

```
<etym>
  <lang>Ahd.</lang>
<mentioned>âband</mentioned>,
<lang>mhd.</lang>
<mentioned>âbent</mentioned>;
<bibl>zur Etym. s. Kluge Mitzka 18. Aufl.
unter „Abend“, ferner Schwäb. Wb. 1,
11ff. Schweizdt. Wb. 1,34ff.</bibl>
</etym>
```

## Structured

```
<etym type="inheritance">
  <cit type="etymon" xml:lang="goh">
    <oRef>âband</oRef>
    <lang>Ahd.</lang>
  </cit>
  <etym type="inheritance">
    <cit type="etymon" xml:lang="gmh">
      <oRef>âbent</oRef>
      <lang>mhd.</lang>
    </cit>
  </etym>
  <bibl>zur Etym. s. Kluge Mitzka 18.
Aufl. unter „Abend“, ferner Schwäb. Wb.
1, 11ff. Schweizdt. Wb. 1,34ff.</bibl>
</etym>
```



# An interesting moment

- Time to complement and consolidate the existing practices
  - TEI as reference framework
  - ISO as a precise standardisation background
- Various ongoing projects and groups
  - Clarin Standards committee, DARIAH WG Lexical Resources, TEI LingSIG
  - COST E-NEL WG2, EU Parthenos
- Joining efforts
  - Towards a single information space
    - Basecamp, GitHub, Blog
    - Exchanging information
  - Increasing participation as experts
    - ISO-TEI in particular

**WHITHER TEI?**

# The TEI is doing well – the hidden TEI

- Antonio Zampolli price by ADHO
  - Reflects that the TEI is pervading all fields in the (digital?) humanities
- TEI has become a natural component of a humanities project based on textual sources
  - Many small editions are flourishing everywhere
  - Now recommended or requested by funding organisations
  - Numerous training events (cf. DiXiT)
- Taken up by larger organisations
  - Academies, Dictionary projects, EPO... especially in Europe

# Consolidating our conceptual model

- TEI as a rich space of elementary constructs
  - Attributes (classes), “entities”, bibliographical and dictionary entries, etc.
- Multifarious document types for various communities
  - From scholarly editions to dictionaries, including computer mediated communication, scientific information, etc.
  - More precise guidelines for specific applications
    - Collaboration with ISO (standards), DARIAH (recommendations)
    - Reducing syntactic freedom in specific application domains, not in TEI as a whole
  - Complementing our stock: onomasiological constructs, standOff
- Strong conceptual basis with pure ODD
  - For TEI and non TEI based application
  - Starting point for offering support to other dissemination formats (JSON, LOD) – Interfacing the trends
  - XML is likely to remain central for a long time for sustainable back-office content

# Focusing, enlarging?

- Enlarging our expert basis
  - Stronger role for SIGs
  - Close coordination with council
  - Bringing in more technical experts from outside
- Institutional partnership
  - Archives, Clarin, DARIAH, MEI, Europeana
    - Further enforcement of the TEI guidelines
    - Sharing our technical platform
      - E.g. EAD maintenance
  - Thinking together the sustainability of TEI material
    - Repositories (Tapas)
    - The TEI already offers a strong basis for sustainability
- Need for a stable communication framework
  - Lively conference and journal (jTEI)
  - Investing in the web site and the wiki

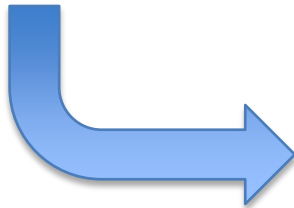
**MERCI !**

# Automatic dictionary structure recognition

PhD theses by Mohamed Khemakhem (Inria, projet H2020 Parthenos)

**pacotille** [pakɔtij] n. f. (esp. *pacotilla*).  
Autref., petit lot de marchandises que pou-  
vaient embarquer les gens de l'équipage ou  
les passagers d'un navire. ● *De pacotille*,  
de peu de valeur, de qualité médiocre.

*CRF (Conditional Random Fields) based data mining*



*Fine grained recognition of the  
various component of an entry in a  
legacy dictionary*

*Using the TEI as reference output format  
(coordination with ENEL recommendations)*

**Perspectives: Creating step by step a  
large-scale network (diachronic and  
synchronic) of our lexical patrimony**

```
<entry>
  <form type="lemma">
    <orth>pacotille</orth>
    <pron><pc>[</pc>pakɔtij<pc>]</pc></pron>
    <gramGrp><pos>n.</pos><gen>f.</gen></gramGrp>
  </form>
  <etym><pc></pc><lang norm="es">esp.</lang>
    <oRef>pacotilla</oRef><pc></pc></etym>
  <sense>
    <usg type="time">Autref.</usg> <pc>,</pc>
    <def>petit lot de marchandises que pouvaient embarquer les gens de  
l'équipage ou les passagers d'un navire</def>
    <pc>.</pc>
  </sense>
  <re>
    <form type="compound">
      <orth>De pacotille</orth>
    </form><pc>,</pc>
    <sense><def>de peu de valeur, de qualité médiocre.</def></sense>
  </re>
</entry>
```